Bald Eagle
Haliaeetus leucocephalus

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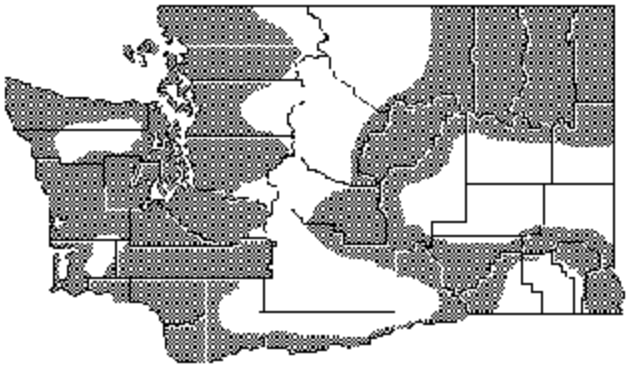
Note: In Washington, landowners who are pursuing land-use changes (e.g., tree-cutting, construction activities) in the vicinity of bald eagle nesting or roosting areas may be required to obtain management plans in order to ensure their new land-use activities comply with bald eagle protection laws. WDFW biologists are available to help landowners develop these management plans. A description of bald eagle management plans and the basic elements they address begins on page 6 of this document.

GENERAL RANGE AND WASHINGTON DISTRIBUTION



General range of the bald eagle, *Haliaeetus leucocephalus*, in Washington (Washington Department of Fish and Wildlife, unpublished data).

Bald eagles breed throughout most of the United States and Canada, with the highest concentrations occurring along the marine shorelines of Alaska and Canada. They winter throughout most of their breeding range, primarily south of southern Alaska and Canada (**U.S. Fish and Wildlife Service 1986,** Stinson et al. 2000).

In Washington, bald eagles nest primarily west of the Cascade Mountains, with scattered breeding areas along major rivers in the eastern part of the state. Wintering populations are found throughout the Puget Sound region, the San Juan Islands, Hood Canal, the Olympic Peninsula, and the upper and lower Columbia River and its tributaries. Major wintering concentrations are often located along rivers with salmon runs.

STATUS AND RATIONALE

The bald eagle is a State Threatened species in Washington. It is vulnerable to loss of nesting and winter roost habitat and is sensitive to human disturbance, primarily from development and timber harvest along shorelines. However, bald eagle populations are recovering and have exceeded most target levels established by the Pacific States Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service 1986, Stinson et al. 2001). Because of its recovery nationwide, the bald eagle is under review for removal from the Federal Threatened species list. In the event of Federal delisting, the bald eagle's status as a State Threatened species in Washington will also be reviewed. Stinson et al. (2001) recommends downlisting the bald eagle to State Sensitive if a change in status is warranted. Regardless of the bald eagle's future status, habitat protection will still be needed in areas where human population growth and development continue to reduce quality bald eagle habitat.

Washington's bald eagles are protected under state and federal law. State wildlife laws afford protection for individual birds, and the Washington Shoreline Management Act provides for some tree retention within 61 m (200 ft) of the shorelines of rivers and marine waters. However, the main protection for eagle habitat was authorized by the Washington State Legislature in 1984 (RCW 77.12.655: Habitat buffer zones for bald eagles -Rules). In addition, the Bald Eagle Habitat Protection Rule (WAC 232-12-292) was adopted in 1986 by the Washington Fish and Wildlife Commission. This rule provides for development of a Site Management Plan whenever activities that alter habitat are proposed near a verified nest territory or communal roost. Site Management Plans may be based on general recommendations from current research, or specific knowledge of individual eagles and their habitat, the surrounding land uses, and landowner goals (Stinson et al. 2001).

The U.S. Fish and Wildlife Service Pacific Bald Eagle Recovery Plan (1986) includes recommendations for managing habitat and human disturbance. Federal permits for projects that may affect bald eagle habitat must be reviewed by the U.S. Fish and Wildlife Service. The Service is developing new management guidelines to promote continued conservation of the bald eagle following its removal from the federal List of Endangered and Threatened Species. Contact the nearest U.S. Fish and Wildlife Service office for management consultation on federally-funded projects.

In 1940, concern over decreasing numbers of bald eagles in the contiguous 48 states prompted Congress to pass the Bald and Golden Eagle Protection Act (16 U.S.C.668-699c). This act makes it illegal for persons to take, kill, harass, possess (without a permit), export or import, or sell any part, nest, or egg of a bald or golden eagle. A violation of the Act can result in fines of up to $250,000, imprisonment for up to two years, or both.

Bald eagles are also protected by the Migratory Bird Treaty Act of 1918 (U.S.C. 703-712), and until delisted in the lower 48 states, the Endangered Species Act of 1973, as amended.

HABITAT REQUIREMENTS

Breeding

Breeding Territories

Eagles defend breeding territories that include the active nest, alternate nests, preferred feeding sites, and perch and roost trees (Stalmaster 1987). Within a territory, snags and trees with exposed lateral limbs or dead tops are used as perches, roosts, and defense stations (U.S. Fish and Wildlife Service 1986). In Washington, breeding territories include upland woodlands and lowland riparian stands with a mature conifer or hardwood component (Grubb 1976, Garrett et al.

1993, Watson and Pierce 1998). Territory size and configuration are influenced by factors such as breeding density (Gerrard and Bortolotti 1988), quality of foraging habitat, and the availability of prey (Watson and Pierce 1998).

Territories sometimes contain alternate nests. Grubb (1980) found that alternate nest trees in territories of Washington eagles were located an average of 350 m (1,050 ft) from occupied nests. Although it is unclear why bald eagles construct alternate nests, they may facilitate successful reproduction if the primary nest is disturbed or destroyed.

The 3 main factors affecting the distribution of nests and territories are: 1) nearness of water and the availability of food; 2) the availability of suitable nesting, perching, and roosting trees; and 3) the number of breeding-age eagles in the area (Stalmaster 1987). An adequate, uncontaminated food source may be the most critical component of breeding habitat for bald eagles (U.S. Fish and Wildlife Service 1986, Stalmaster 1987). Breeding eagles in Washington primarily consume live or dead marine and fresh-water fishes, and also waterfowl and seabirds. Secondary food sources include mammals, molluscs, and crustaceans (Retfalvi 1970, Knight et al. 1990, Watson et al. 1991, Watson and Pierce 1998).

Grubb (1980) found an average territory radius of 2.5 km (1.6 mi.) in western Washington. Home ranges of 50 pairs of bald eagles throughout Puget Sound averaged 6.8 km^2 (4.2 mi^2) (Watson and Pierce 1998). Ranges included areas occupied during occasional excursions beyond defended territories. Core areas of intense use averaged 1.5 km^2 (0.9 mi^2) in size. On the lower Columbia River, the mean home range size and minimum distance between eagle nests was 22 km^2 (13.6 mi^2) and 7.1 km (4.4 mi), respectively (Garrett et al. 1993). The distance eagles maintain between adjacent, occupied territories may be important for maintaining their productivity when food resources are limited (Anthony et al. 1994).

Courtship and Nest Building

In Washington, courtship and nest building activities intensify in January and February. Bald eagles commonly build large stick nests in mature trees, which are used over successive years. Eagles select nest trees for structure rather than tree species (Anthony et al. 1982, Anthony and Isaacs 1989). A typical nest tree is dominant or co-dominant within the overstory. It usually provides an unobstructed view of nearby water and has stout upper branches that form flight windows large enough to accommodate an eagle's large wingspan (Grubb 1976). It is usually live, though it often has a dead or broken top with a limb structure that supports the nest. Bald eagle nests are usually located within the top 7 m (20 ft) of the tree (U.S. Fish and Wildlife Service 1986).

Bald eagles prefer to nest along marine and freshwater shorelines. Approximately ninety-seven percent of Washington's active bald eagle nests are within 914 m (3000 ft) of a lake, river, or marine shoreline (Stinson et al. 2001). The average distance between these nests and open water varies slightly with shore type [marine:140 m (457 ft), river:193 m (633 ft), lake:304 m (997 ft)]. In examining 218 bald eagle nests, Grubb (1980) found that their average distance from water was 86 m (282 ft). These distances ranged from 4.6 - 805 m (15 - 2,640 ft). Fifty-five percent were within 46 m (150 ft) and 92% were within 183 m (600 ft) of a shoreline.

Eggs and Eaglets

Egg-laying begins in late February, with most pairs incubating by the third week of March (Watson and Pierce 1998). Eaglets hatch after a 35-day incubation period (Stalmaster 1987). Most eaglets fledge in mid-July but remain in the vicinity of the nest for several weeks prior to dispersal (Anderson et al. 1986, Watson and Pierce 1998). Most juvenile and adult bald eagles that nest in western Washington migrate to British Columbia and southeast Alaska in late summer and early fall. Adults return to their Washington territories by early winter (Watson and Pierce 1998).

Wintering

Migrant eagles from other states and provinces begin arriving at their traditional Washington wintering grounds during late October, and most disperse by March (Biosystems, Inc. 1980, 1981; Fielder and Starkey 1980; Garrett et al. 1988;

Stalmaster 1989; Watson and Pierce 2001). Wintering bald eagles are attracted to western Washington by abundant prey, particularly salmon carcasses on Puget Sound tributaries.

Food Sources

Because wintering eagles often depend on dead or weakened prey, their diet may vary locally. In Washington, various types of carrion are important food items during fall and winter, including spawned salmon (primarily chum) taken from gravel bars along rivers (Stalmaster et al. 1985, Stalmaster 1987). Cattle carcasses and afterbirths, road-killed deer, and crippled waterfowl are important food sources where salmon carcasses are unavailable (J. Watson, personal observation).

Day Perches and Roosting Habitat

Wintering eagles select day perches according to their proximity to food sources (Steenhof et al. 1980). Perch trees tend to be the tallest available, and eagles will consistently use their preferred branches. A variety of tree species, both alive and dead, are used for perching (Stalmaster 1976).

Bald eagles may roost communally in winter, with 3 or more eagles perching consecutive nights in the same trees. Communal roosting probably enhances food-finding in nearby foraging areas (Knight and Knight 1984). Eagles sometimes gather in staging trees located between feeding grounds and roost trees prior to entering the night roost (Hansen et al. 1980, Anthony et at. 1982, Stalmaster 1987).

Because bald eagles leave little permanent sign of their presence after they depart wintering areas (i.e., no nest), emphasis in Washington state has been given to identifying the locations and describing characteristics of communal roosts during winter (Hansen 1977, Hansen et al. 1980, Keister 1981, Knight et al. 1983, Stellini 1987, Watson and Pierce 1998). Key roost components include core roost stands, buffer trees, flight corridors and staging trees, and foraging areas associated with roosts (Stalmaster 1987). Roost tree species vary with geographic area, but communal roost stands are generally uneven-aged with a multi-layered canopy, often on leeward-facing hillsides or in valleys. Such characteristics create favorable microclimates within roosts that promote energy conservation (Hansen et al. 1980, Keister 1981, Stalmaster and Gessaman 1984, Stellini 1987). Watson and Pierce (1998) documented twenty-six roosts on major tributaries of Puget Sound and found that eagle territories averaged 9 ha (22 ac) in size, were located <1.1 km (0.7 mi) from foraging areas, and contained roost trees that were larger in diameter, taller, and more decadent than random trees.

LIMITING FACTORS

Activities that permanently alter bald eagle habitat (e.g., removal of nest, roost, and perch trees, and removal of buffers without regeneration of trees of adequate size and structure), and activities that temporarily disturb eagles to the point of reproductive failure or reduced vigor (e.g., construction, logging, pedestrian activity, boating) are the greatest threats to nesting and wintering eagle populations in Washington state. Food availability may also be an issue in areas with dwindling salmon runs (Stinson et al. 2001). As Washington's human population grows, these types of disturbances and changes to the landscape will also increase. The current availability of large, mature trees along shorelines, and the availability of these trees in the future, will play a primary role in determining how bald eagles will ultimately fare in Washington (Stinson et al. 2001).

Human Population

Washington is the sixth fastest growing state in the nation and the second fastest growing western state (Department of Natural Resources 1998). Most of this growth is occurring in the Puget Sound region, where it impacts bald eagle

habitat along shorelines (Solomon and Newlon 1991). Half of Washington's 5.4 million people live near the shores of Puget Sound, Hood Canal, and the Pacific Ocean, the same areas where our bald eagle population is concentrated. If current trends continue, Washington's human population will double to 11 million people by 2045. Between 1970 and 1995 the amount of land used for the construction of houses and businesses doubled in the central Puget Sound Region (Department of Natural Resources 1998). As of 1998, two-thirds of the 638 occupied bald eagle nesting territories were on private lands. As of 2000, there were 1154 bald eagle site management plans in Washington. Of these, 831 (72%) were for residential development (Stinson et al. 2001).

Simultaneous growth in bald eagle numbers has resulted in a small proportion of the eagle population establishing territories in habitat patches within urban environments. The greater tolerance of human activity exhibited by these pairs should not be interpreted as the norm for the population, because some birds become accustomed to human activity whereas others tolerate very little (Stalmaster 1987). Although bald eagle populations recently have increased, cumulative habitat changes over time, especially the loss of large trees along shorelines, have the potential to reduce habitat quality, confine eagles to smaller areas, and cause population declines (Stalmaster 1987, Stinson et al. 2001).

Disturbance

Activities associated with timber harvest, and the construction and occupation of homes have the greatest potential to disturb nesting and wintering bald eagles in Washington. These activities cause short- and long-term increases in human activities which may result in long-term habitat alterations.

Watson and Pierce (1998) found that pedestrian activity was the most common human activity within 400 meters (1,300 ft) of 37 eagle nests in western Washington. Along with aircraft, pedestrian activities cause the highest active disturbance responses in bald eagles (Stinson et al. 2001). Research from across the United States shows that pedestrian activities tend to affect eagle behavior at distances up to 991 m (3250 ft) from nests (Fraser et al. 1985, Grub and King 1991, Grubb et al. 1992, Steidl 1994). Watson and Pierce (1998) found that pedestrian activity increased eagles' flush and agitation responses at <120 m (394 ft), and reduced incubation time at <200 m (656 ft). Similarly, vehicles and pedestrians elicited the highest responses from eagles in Michigan, although aircraft- and aquatic-related activities were more common (Grubb et al. 1992).

Activities such as boating, fishing, and aircraft can negatively affect eagle behavior. Foraging eagles on the Columbia River estuary maintained an average distance of 400 m (1,300 ft) from stationary boats, and they responded to boat presence by reducing feeding time and the number of foraging attempts (McGarigal et al. 1991). Aircraft may disturb nesting eagles depending on the aircraft type (e.g., helicopter, fixed-wing, jet) and the distances of approach to nests (Watson 1993). Flights of non-motorized hang gliders required buffers of 366 m (1,200 ft) to avoid disturbing nesting eagles in southwest Washington (D. Anderson, personal communication). However, Watson et al. (1996) found that low levels of clam harvest activity by boats on Hood Canal was unlikely to affect foraging eagles.

Many studies have characterized nest site selection for bald eagles and identified the detrimental effects of habitat alteration on eagle nesting (Juenemann 1973, Andrew and Mosher 1982, Anthony and Isaacs 1989, Buehler et al. 1991). Fewer studies, however, have defined specific distances to which nesting bald eagles responded to habitat alterations associated with residential development, and their conclusions are varied. Grubb (1980) and Parson (1992) reported average distances of 119 m (390 ft) and 93 m (305 ft) respectively, between productive bald eagle nests and habitat alterations in rural-residential Washington. Grubb (1980) also reported an average distance of 73 m (240 ft) between unproductive bald eagle nests and permanent human activity.

A literature review on how noise impacts raptors (Knight and Gutzwiller 1995) found that raptor responses vary, and can include attraction, tolerance, or aversion to the noise. Effects of noise on bald eagles from residential and recreational activities have not been thoroughly studied. Noise produced by pile driving was considered inconsequential to eagle behavior beyond 400 m (1,300 ft) in the San Juan Islands (Bottorff et al. 1987).

Mortality

Mortality of bald eagles from shooting and electrocution still occur, but the numbers killed by these means are unknown in Washington state. Productivity of regional bald eagle populations (e.g., Columbia River estuary and Hood Canal) may be affected by, lead, PCBs, mercury, organochlorides, organophosphates, and other toxic contaminants. Secondary poisoning from pesticides (e.g., carbofuran, famphur) has resulted in local die offs in northwest Washington (Stinson et al. 2001, D. Baker, personal communication).

BALD EAGLE SITE MANAGEMENT PLANS

The Bald Eagle Protection Rule (WAC 232-12-292) requires a bald eagle management plan for proposed land-use activities involving land containing or adjacent to an eagle nest or communal roost.

In the 1980's, WDFW attempted to work with multiple landowners to develop large-scale territory plans involving active and alternate nest sites, and perching and foraging habitat (Figure 1). This was a time-consuming process which was not adequately funded, and permit delays were inevitable. It was apparent that some landowners wanted to expedite the regulatory permit process. As a result, WDFW began working with state agencies and local governments to provide alternatives that would simplify the permit process. Generalized Bald Eagle habitat Management Zones (Figure 2) were developed for this purpose along with the generic Site Management Plan which may be issued by local governments.

There are currently 3 options available for bald eagle management plans in Washington:

1) Federal or State Landscape Plans - If a landowner is developing a federal Habitat Conservation Plan (HCP) or a state Landowner Landscape Plan (LLP), WDFW can assist with a long-term conservation strategy for bald eagle habitat. If the strategy is approved by WDFW, then a separate bald eagle management plan is not necessary for each action within the area covered by the HCP or LLP.

2) Custom Plans - A WDFW biologist will work with landowners to develop custom site management plans for forest practice, shoreline, or hydraulic permits; and for subdivisions, short plats, and planned unit developments. A landowner may develop his or her own site-specific plan, or hire a consultant to do so, for approval by WDFW.

3) Generic Plans - WDFW may provide local government permit offices with generic bald eagle site management plans. Landowners may use these generic plans for septic, clearing, grading, road-building (if a DNR permit is not required) and single family home construction. If landowners cannot comply with the generic plan, or if a subdivision or planned unit development is intended, they should contact WDFW for a custom plan (see 2, above).

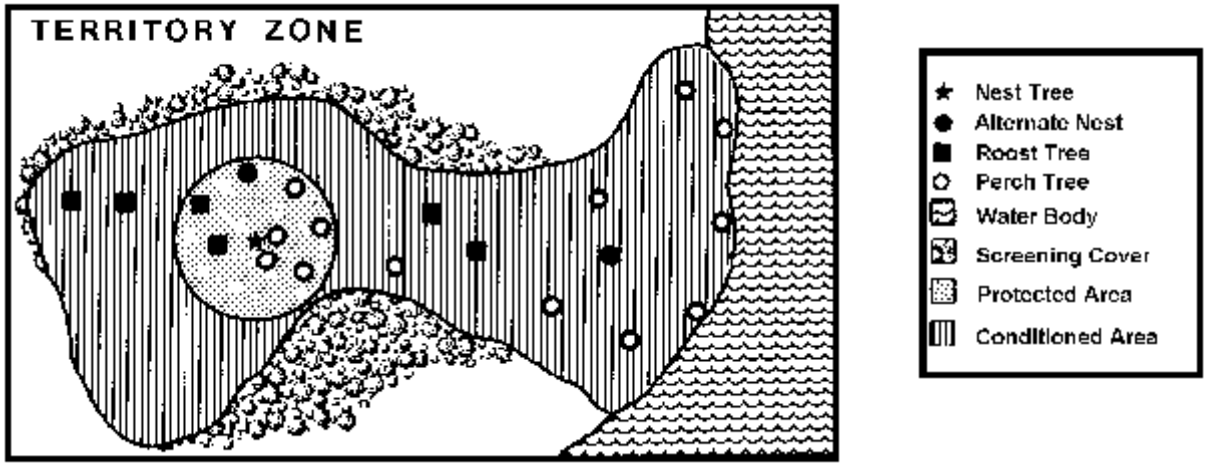


Figure 1. Territory management approach for bald eagle habitat (adapted from Stalmaster 1987).

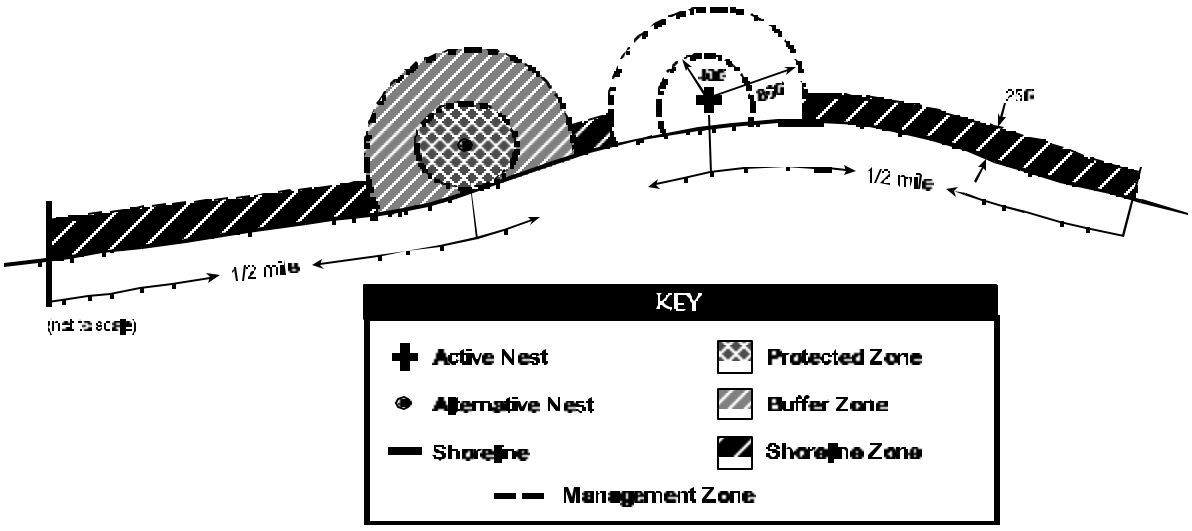


Figure 2. WDFW generalized bald eagle habitat management zones.

Process for Landowners

Landowners planning new construction of buildings, roads, or docks; septic installation; timber harvest; land conversion; pesticide or other chemical applications; blasting activities, etc. in the vicinity of bald eagle nest or roost sites will be required to obtain a permit and/or a bald eagle site management plan. Most permits are available through county offices, though forest practice activities must be approved by the Department of Natural Resources (DNR). Washington counties and DNR obtain bald eagle nest and roost site information from WDFW.
For county permits, if the proposed activity is further than 122 m (400 ft) from the nest or roost, the county provides the landowner with WDFW's general conditions for bald eagle habitat protection. This is a generic plan that is signed by the landowner and attached to the permit. If the proposed activity is within 122m (400 ft) of a nest or roost, or if the landowner cannot comply with the conditions on the WDFW generic plan, they should contact the appropriate WDFW Regional Office to request a site-specific management plan. A WDFW biologist will discuss development plans and options to protect eagle habitat with the landowner. Once WDFW approves a management plan for the site, it is attached to the permit issued by the county.

For proposed forest practice activities less than 800 m (0.5 miles) from a bald eagle nest or roost, DNR may ask the landowner to obtain a bald eagle site management plan. WDFW will determine and document whether or not a proposed activity is a conflict to eagles. If a management plan is needed, a WDFW biologist will consult with the landowner to discuss development plans and options to protect eagle habitat. Once WDFW approves a management plan for the site or determines that the land use will not impact the eagles, DNR will process the forest practice application.

Elements Addressed by Bald Eagle Management Plans

Breeding Habitat

Residential development, timber harvest, and the construction of buildings, roads, and piers along shorelines are the main habitat alterations affecting breeding eagles in Washington. Habitat management for nesting bald eagles generally occurs within 400m (1320 ft) of the shores of Washington's outer coast, the Puget Sound, and major rivers and lakes. Maintaining tree and stand structure, and maintaining adequate distances between habitat alterations and nest trees, are the key factors for managing habitat near breeding eagles in Washington. The long-term goal in managing habitat alterations is to maintain suitable nest and perch trees within existing territories to insure their continued occupancy by bald eagles (Stinson et al. 2001).

In Oregon, management for uneven-aged forests, dominated by Douglas-fir west of the Cascades and ponderosa pine east of the Cascades, enhanced the potential for future nesting (Anthony and Isaacs 1989). Although maintaining unaltered old-growth stands may provide optimum bald eagle habitat, the necessary structural characteristics may be supplied by a carefully managed, younger forest over time. Selective logging in younger forests may be prescribed to maintain or enhance desired characteristics of nesting or roosting habitat (Stalmaster 1987). Forests that were hand-logged prior to 1940, which left remnant old-growth trees, provided bald eagle breeding habitat along coastal British Columbia in the 1980s (Hodges et al. 1984).

Tree and Stand Structure. Maintain as many mature trees as possible to protect forage, perch, alternate nest, and roost habitat (Anthony and Isaacs 1989). An analysis of nest tree characteristics in western Washington concluded that nest trees were co-dominant with other large trees in uneven-aged stands. Usually the trees were <25% dead and had broken tops (Grubb 1980). More recent evaluation of 37 nests in western Washington found eagles using the largest, tallest trees, with average nest height of 35±9 m (115±30 ft), and nest tree diameter at breast height (dbh) of 116±41 cm (45±18 in) (Watson and Pierce 1998).

Human Disturbance. The keys to preventing disturbances of nesting bald eagles in Washington are maintaining adequate distances between human activities and nest trees, and timing activities so that they don't interfere with nesting. WDFW recommends scrutiny of construction activities that result in increased pedestrian activity within 240 m (800 ft) of nests, as well as careful management of public trails and camping within this distance (Watson and Pierce 1998). Additionally, during the nesting season, avoid activities such as tree cutting, the use of heavy machinery, pile driving, and blasting within 240 m (800 ft) of active bald eagle nests. These activities have a greater potential for disturbance beyond visual effects because they generate noise (U.S. Fish and Wildlife Service 1986). Observations of adult eagles can help determine whether or not human activities are causing the eagles to alter their behavior. Aggressive behavior, alarm calls, and adults flushing from their nest or perch indicate significant disturbance.

Timing. Activities within 240 m (800 ft) of nest trees that may disturb bald eagles should be conducted outside of the critical breeding period. The critical breeding period for Washington's bald eagles begins with courtship in early January and ends with juvenile dispersal in mid- to late-August (Watson and Pierce 1998, S. Zender, personal communication). Bald eagles in Oregon have a similar nesting phenology, with January 1 through August 31 identified as the time when human activities are most likely to affect breeding success (Isaacs et al. 1983). In residential areas, bald eagles that show tolerance to humans may not need the same distance or period of protection from disturbance (J. Bernatowicz, personal communication; S. Negri, personal communication).

Screening. Maintain high tree density and moderate canopy closure to visually buffer bald eagle nests from human activities. In Washington, Watson and Pierce (1998) found that complete vegetative screening around nests dramatically reduced the time and frequency of eagles' responses to disturbance. Partial screening had less of a positive effect, although it did reduce response distance. In the same study, eagles nesting in taller trees at heights >47 m (154 ft) had significantly reduced responses to a walking pedestrian compared to nests that were lower in trees.

Windthrow. A nest stand's vulnerability to windstorms is an important consideration when determining buffer distances and minimum stand size (Anthony and Isaacs 1989). Maintain a buffer of 120-240 m (400-800 ft) from the nest in order to protect the core stand from the effects of windthrow. The shape of the buffer may vary with site topography and prevailing wind direction to maximize vegetative screening and protection of the core stand. Buffers with variable widths can be designed after conducting a windthrow hazard assessment that takes into account prevailing wind direction, soil conditions, etc. (Sathers et al. 1994). Currently, the Washington Forest Practices Regulations use forested buffers of 60-120 m (200-400 ft) for wetlands and marbled murrelet nest stands. Thinning and salvage logging is allowed within these buffers, provided that the residual forest can withstand major wind penetration. Research on the effects of windthrow indicates that the creation of abrupt forest openings may result in negative impacts to residual forest stands. Wind penetration has been documented up to 60 m (200 ft) into a conifer forest interior (Fritschen et al. 1971). Decreases in tree densities and tree canopy cover were noted up to 120 m (400 ft) into conifer forest from the clearcut edge (Chen et al. 1992). These changes were attributed mostly to tree mortality and windthrow caused by high wind velocities along new clearcut edges. A forested buffer can mitigate these edge effects on core nest or roost stands.

Buffer Distances. Buffers between 100-1,200 m (330-4,000 ft) have been recommended throughout the United States to protect the integrity of nest trees and stands (Mathison et al. 1977; U.S. Fish and Wildlife Service 1982, 1986; Fraser et al. 1985; Anthony and Isaacs 1989; Grubb and King 1991; Grubb et al. 1992). Nests and nest trees must be protected year-round, since bald eagles typically use and maintain the same nests year after year. In addition, nests that appear to be abandoned also need protection, since bald eagles often construct alternate nests that are used periodically. When developing site management plans, WDFW recommends buffering bald eagle nests with a two-zone management system that

mimics a strategy designed by the U.S. Fish and Wildlife Service (1981). The following guidelines for these zones are based on the research cited in this document:

- **Protected Zone (Primary Zone).** This zone protects and screens the nest tree and should extend at least 120 m (400 ft) from the nest tree. Its size and shape will vary with site conditions such as topography, prevailing winds, and screening vegetation, as well as on the eagles' tolerance to human activities. In areas where vegetation and/or topography don't provide adequate screening within 120 m (400 ft) of the nest, consider increasing the size of the protected zone. Retain all existing large trees and existing forest structure within the protected zone. Activities that significantly alter the landscape or vegetation, such as timber harvest; construction of buildings, roads, or power lines; mining; and the application of chemicals that are toxic to plants or animals, should be avoided in this zone. In some situations, noisy, non-destructive activities that can disturb eagles may need to be postponed until after the breeding and nesting seasons.
- **Conditioned Zone (Secondary Zone).** The conditioned zone further screens and protects nest sites in the protected zone and should extend from 100 to 240 m (330-800 ft) beyond the edge of the protected zone. Alternate nest locations, perch trees, and feeding sites should be included in this zone and will influence its size and shape (Stallmaster 1987). Depending on screening vegetation, prevailing winds, topography, and the sensitivity of the nesting eagles to human activities, this zone may need to be expanded up to 800 m (2640 ft) from the edge of the protected zone. Avoid constructing facilities for noisy or intrusive activities, such as mines, log transfer and storage areas, rock crushing operations, and oil refineries, in the conditioned zone. High-density housing and multi-story buildings should also be avoided. Avoid constructing roads or trails within sight of the nest that would facilitate human or predator access to the nest. Construction activities (e.g., homes, roads, and power lines) that take place out of sight of the nest should be postponed until after the young eagles have fledged, as should forest practice activities. Timber harvest within conditioned zones should be designed to avoid blowdown and to provide future nest tree recruitment. Short term, unobtrusive activities, or those shown not to disturb nesting eagles, such as the use of existing roads, trails, and buildings, can occur year-round in the conditioned zone.

Roosting Habitat

Timber harvest, and the construction of roads and buildings are the main habitat alterations that negatively affect roosting eagles in Washington. The long-term goal in managing these alterations is to maintain suitable roost trees and roost components over time in areas inhabited by bald eagles in order to ensure their continued use. Key roost components included core roost stands, buffer trees, flight corridors and staging trees, and prey bases associated with roosts (Stalmaster 1987). Roost tree species vary with geographic area, but communal roost stands are generally uneven-aged with a multi-layered canopy and are often on leeward-facing hillsides or in valleys.

Timber Harvest. Avoid timber harvest within the core stands of communal roost trees and staging areas. Maintain vegetative buffer zones within 120 m (400 ft) from the edge of such stands. Buffer stand density and width should be based on windthrow potential and the need for effective visual screening (see Breeding Habitat). Eleven of 12 roosts studied throughout Washington by Knight et al. (1983) had experienced some degree of timber harvest. These researchers also noted roost abandonment when roost areas were harvested. Anthony et al. (1982) concluded that perpetuating roost habitat with trees that average 131-300 years old was incompatible with 40-80-year stand rotations typical of forest management west of the Cascade Mountain crest.

Human Disturbance. Activities that produce noise or visual effects within 120 m (400 ft) of the edges of communal roost trees or staging trees should be conducted outside of the critical roosting period (November 15 - March 15). This corresponds to the time when most eagles begin to arrive in eastern and western Washington, with numbers peaking in December and January and declining rapidly by mid-March (Biosystems, Inc. 1980, 1981; Fielder and Starkey 1980; Garrett et al. 1988; Stalmaster 1989).

Perching and Foraging Habitat

Perches along shorelines near winter roosts or in nesting territories are important to foraging eagles. Tree structure, and the distance between habitat alterations and shorelines should be considered when managing for bald eagle wintering habitat.

Perch Structure and Location. In Washington, protect known bald eagle perch trees and potential foraging perches greater than 51 cm (20 in) dbh and within 75 m (246 ft) of the top of a bank or shoreline. Chandler et al. (1995) studied the influence of shoreline perch trees on bald eagle distribution in Chesapeake Bay and found that shoreline segments used by eagles had more suitable perch trees, more forest cover, and fewer buildings than unused segments. Eagles used suitable perch trees that were less than 50 m (164 ft) from the shoreline but preferred those closer than 10 m (33 ft). This is consistent with other authors who observed bald eagles perching less than 50 m (164 ft) from shore (Stalmaster and Newman 1979, Steenhof et al. 1980, Buehler et al. 1992). Similarly, tall perch trees in leave strips that are 50-100 m (160-330 ft) wide along shorelines of major feeding areas were deemed important for foraging eagles (Stalmaster 1987). Also, Chandler et al. (1995) described how to map shoreline areas that could be managed or restored to maintain suitable bald eagle foraging habitat. They recommended protecting patches of shoreline forest, and specifically protecting live and dead trees over 20 cm (8 in) dbh for future habitat.

Human Disturbance. Bald eagles often feed on the ground, in open areas where food resources are concentrated. They should be allowed a distance of at least a 450 m (1,500 ft) from human activity and permanent structures. Buffer zones of 250-300 m (800 ft-1,000 ft) have been recommended in perching areas where little screening cover is present (Stalmaster and Newman 1978). Stalmaster and Newman (1979) found that 50% of wintering eagles in open areas flushed at 150 m (500 ft) but 98% would tolerate human activities at 300 m (1,000 ft). Activities that disturb eagles while feeding, especially during winter, can cause them to expend more energy, which increases their susceptibility to disease and poor health (Stalmaster 1987).

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KEY POINTS

Habitat Requirements

- Breeding - Bald eagles breed in uneven-aged forest stands along shorelines where there is minimal human activity. Nest trees are usually large, and are dominant or co-dominant within the overstory.
- Roosting - Bald eagles roost in uneven-aged forest stands with large trees that provide protection from weather. Roosts are often on leeward-facing hillsides or in valleys.
- Perching - Tall trees and snags along shorelines provide perching habitat for bald eagles.
- Feeding - An adequate source of uncontaminated prey is required for bald eagles. Salmon, gulls, and waterfowl are major components of the bald eagle's diet.

State and Federal Laws

- Three federal laws provide protection for the bald eagle: the Endangered Species Act, the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act. The U.S. Fish and Wildlife Service Pacific Bald Eagle Recovery Plan (1986) includes recommendations for managing habitat and human disturbance. Projects involving federal permits that may affect bald eagle habitat must be reviewed by the U.S. Fish and Wildlife Service. Contact the nearest U.S. Fish and Wildlife Service office for management consultation on federally-funded projects.
- Through the Bald Eagle Protection Rule (WAC 232-12-292), Washington State law requires the development of a cooperative Site Management Plan whenever activities that alter habitat are proposed near a verified bald eagle nest territory or communal roost.

Elements Addressed by Bald Eagle Management Plans

- The habitat management zone for nesting bald eagles is within 400 m (1/4 mi) of the marine shorelines of Washington's outer coast and Puget Sound, and the shorelines of major rivers and lakes.
- Maintain as many mature trees as possible to protect forage, perch, alternate nest, and roost habitat.
- WDFW recommends scrutiny of construction activities that result in increased pedestrian activity within 240 m (800 ft) of nests, as well as careful management of public trails and camping within this distance (Watson and Pierce 1998).
- Avoid activities such as tree cutting, the use of heavy machinery, pile driving, and blasting within 240 m (800 ft) of bald eagle nests during the breeding season.
- Maintain high tree density and moderate canopy closure to visually buffer bald eagle nests from human activities.
- A buffer of 120-240 m (400-800 ft) from the nest should be maintained to protect the core stand from the effects of windthrow. The shape of the buffer may vary with site topography and prevailing wind direction to maximize vegetative screening and protection of the core stand.

- Nests and nest trees must be protected because bald eagles typically use and maintain the same nests year after year. In addition, nests that appear to be unoccupied also need protection, because bald eagles often construct alternate nests that are used periodically.

- Buffer bald eagle nests with a two-zone management system, consisting of a protected zone $\geq$120 m (400 ft) from the nest tree and a conditioned zone that extends from 100 to 240 m (330-800 ft) beyond the edge of the protected zone. The size and shape of each zone will depend on screening vegetation, prevailing winds, topography, and the sensitivity of the nesting eagles to human activities. Large trees (>20 in dbh) should be retained in both zones.

- Protect core communal roost stands and staging stands with a buffer of approximately 120 m (400 ft) around core stands. The forest structure of buffer stands should include large trees and follow prescriptions to prevent deterioration from the effects of windthrow.

- Activities that produce noise or visual effects within 120 m (400 ft) of the edges of communal roost trees or staging trees should be conducted outside of the critical roosting period (November 15 - March 15).

- Leave 250 ft wide strips of perch trees and protective buffers along shorelines within eagle nesting territories and winter feeding areas.

- Consider timing restrictions to avoid activities that may disturb eagles during critical periods. The following periods and distances may be less in urbanizing areas where eagles show more tolerance to human activities:
  Breeding: 1 January - 31 August within 800 ft of nest trees
  Wintering: 15 November - 15 March within 400 ft of roost stands

- In foraging areas with little or no screening, bald eagles that are feeding should be allowed at least 450 m (1500 ft) from human activity and permanent structures.

- Perch trees and potential foraging perches >51 cm (20 in) dbh and <75 m (246 ft) from the top of a bank or shore should be protected.